WHAT IS CLAIMED IS:

1. A polymer electrolyte fuel cell stack comprising a plurality of unit cell main components juxtaposed in the same direction and electrically connected in series with each other, wherein

each unit cell main component comprises:

a membrane electrode assembly including a proton exchange membrane, and a fuel electrode and oxidizer electrode placed on opposing plate surfaces of the proton exchange membrane;

a separator including, except for those placed at end portions in the direction of juxtaposition, a plurality of first reactant gas flow paths to supply a first reactant gas, formed substantially linearly in a vertical direction in a plate surface to be brought into contact with one of the fuel electrode and the oxidizer electrode, and a plurality of second reactant gas flow paths to supply a second reactant gas, formed in a rear plate surface of the plate surface; and

water supply means for cooling the unit cell main component by a latent heat system by supplying water to the first reactant gas flow paths, the water supply means including a manifold formed in the vertical direction to extend through the separator, a first water supply path positioned, in the surface in which the second reactant gas flow path is formed, above a lowermost portion in the vertical direction of

the manifold, and continuously formed in a horizontal direction, a plurality of through holes formed with a predetermined spacing from the first water supply path so as to communicate with the first reactant gas flow paths, and a plurality of second water supply flow paths which are formed between the through holes and first water supply path so as to allow the through holes to communicate with the first water supply path, and which guide water in the first water supply path to the through holes.

2. A polymer electrolyte fuel cell stack comprising a plurality of unit cell main components juxtaposed in the same direction and electrically connected in series with each other, wherein

each unit cell main component comprises:

a membrane electrode assembly including a proton exchange membrane, and a fuel electrode and oxidizer electrode placed on opposing plate surfaces of the proton exchange membrane;

a separator including, except for those placed at end portions in the direction of juxtaposition, a plurality of fuel gas flow paths to supply a fuel gas, formed substantially linearly in a vertical direction in a plate surface to be brought into contact with the fuel electrode, and an oxidizer gas flow path to supply an oxidizer gas, formed in a plate surface to be brought into contact with an oxidizer electrode of

an adjacent membrane electrode assembly different from the predetermined membrane electrode assembly; and

water supply means for cooling the unit cell main component by a latent heat system by supplying water to the fuel gas flow paths, the water supply means including a water manifold formed in the vertical direction to extend through the separator, a first water supply path positioned, in the surface in which the oxidizer gas flow path is formed, above a lowermost portion in the vertical direction of the water manifold, and continuously formed in a horizontal direction, a plurality of through holes formed with a predetermined spacing from the first water supply path so as to communicate with the fuel gas flow paths, and a plurality of second water supply flow paths which are formed between the through holes and first water supply path so as to allow the through holes to communicate with the first water supply path, and which guide water in the first water supply path to the through holes.

3. A polymer electrolyte fuel cell stack comprising a plurality of unit cell main components juxtaposed in the same direction and electrically connected in series with each other, wherein

each unit cell main component comprises:

a membrane electrode assembly including a proton exchange membrane, and a fuel electrode and oxidizer

electrode placed on opposing plate surfaces of the proton exchange membrane;

a separator including, except for those placed at end portions in the direction of juxtaposition, a plurality of fuel gas flow paths to supply a fuel gas, formed substantially linearly in a vertical direction in a plate surface to be brought into contact with the fuel electrode, and a plurality of oxidizer gas flow paths to supply an oxidizer gas, formed in a plate surface to be brought into contact with a plate surface and an oxidizer electrode of an adjacent membrane electrode assembly different from the predetermined membrane electrode assembly; and

water supply means for cooling the unit cell main component by a latent heat system by supplying water to the fuel gas flow paths, the water supply means including a manifold formed in the vertical direction to extend through the separator, a third water supply path positioned, in the surface in which the oxidizer gas flow paths is formed, above a lowermost portion in the vertical direction of the manifold, and continuously formed in a horizontal direction,
a plurality of through holes formed in the third water supply path so as to allow the third water supply path to communicate with the fuel gas flow paths, and
a plurality of continuous fourth water supply paths which are formed in the surface of the separator, in

which the fuel gas flow paths are formed, and guide water supplied from the through holes to the fuel gas supply paths.

4. A polymer electrolyte fuel cell stack comprising a plurality of unit cell main components juxtaposed in the same direction and electrically connected in series with each other, wherein

each unit cell main component comprises:

a membrane electrode assembly including a proton exchange membrane, and a fuel electrode and oxidizer electrode placed on opposing plate surfaces of the proton exchange membrane;

a separator including, except for those placed at end portions in the direction of juxtaposition, a plurality of first reactant gas flow paths to supply a first reactant gas, formed substantially linearly in a vertical direction in a plate surface to be brought into contact with one of the fuel electrode or the oxidizer electrode, and a plurality of second reactant gas flow paths to supply a second reactant gas, formed in a rear plate surface of the plate surface; and

water supply means for cooling the unit cell main component by a latent heat system by supplying water to the first reactant gas flow paths, the water supply means including a manifold formed in the vertical direction to extend through the separator, a third water supply path positioned, in the surface in which

the second reactant gas flow path is formed, above a lowermost portion in the vertical direction of the manifold, and continuously formed in a horizontal direction, a plurality of through holes formed in the third water supply path so as to allow the third water supply path to communicate with the first reactant gas flow paths, and a plurality of continuous fourth water supply paths which are formed in the surface of the separator, in which the first reactant gas flow paths are formed, and guide water supplied from the through holes to the first reactant gas supply paths.

5. A polymer electrolyte fuel cell stack according to any one of claims 1 to 4, wherein a sectional area of the first water supply path branched from the water manifold decreases away from the water manifold.

6. A polymer electrolyte fuel cell stack according to any one of claims 1 to 4, wherein a pitch of the communication holes adjacent to each other is an integral multiple of a pitch of the fuel gas flow paths adjacent to each other.